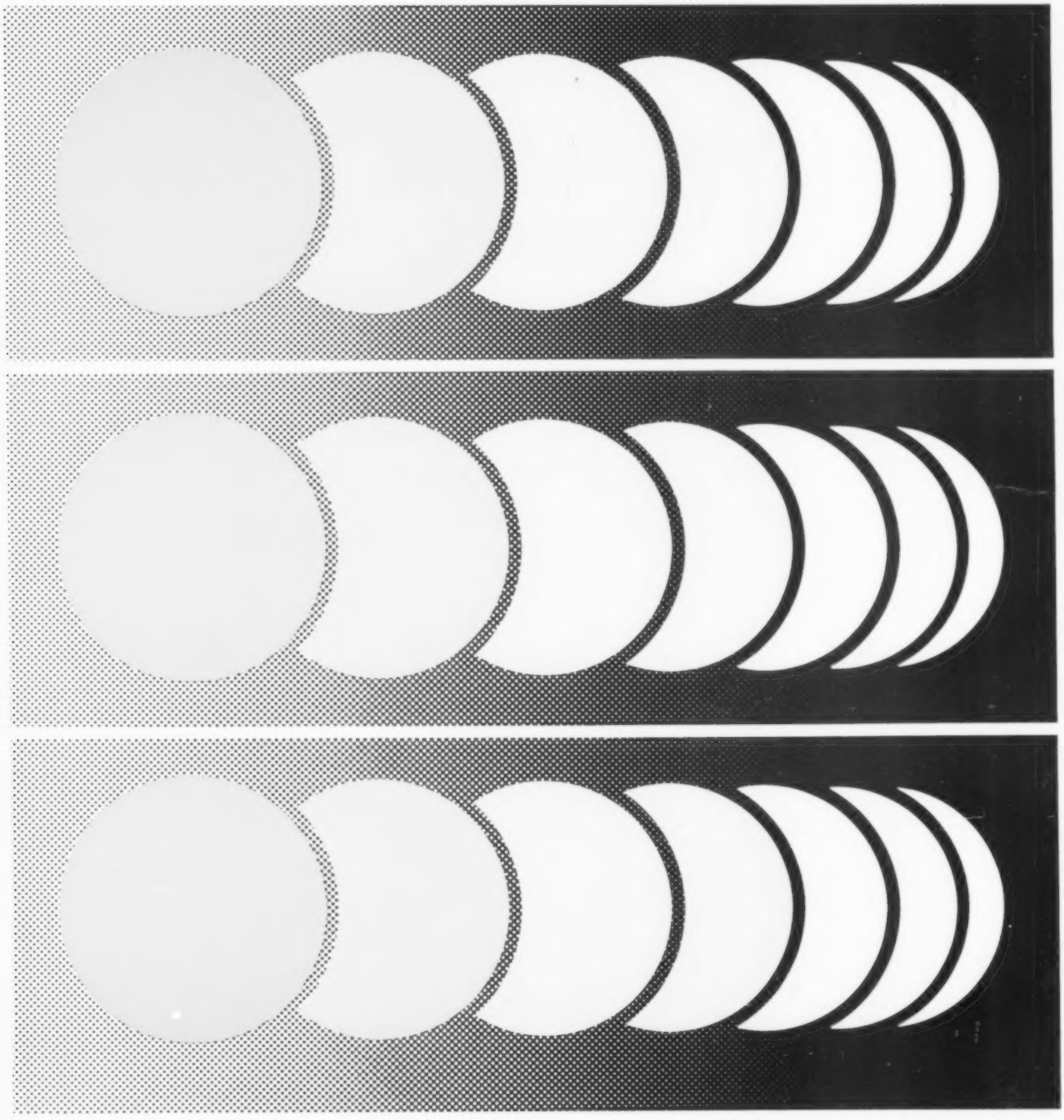
DIMENSIONS/NBS

The magazine of the National Bureau of Standards U.S. Department of Commerce

April 1979



SUMMER ENERGY-SAVING TIPS. See page 7.

COMMENT

A WINNING SEASON

Satchel Paige, the great baseball player, had some words of wisdom for anyone who operates in a competitive arena: "Never look back; somebody might be gaining on you."

With those words in mind, I still want to note that for DIMENSIONS/NBS, this has been a winning season. We have been recognized twice with Awards of Excellence from the Society for Technical Communication (STC), an organization with over 3000 members and more than 50 chapters worldwide. The first award came from the Washington, D.C., chapter of the society and the second came from the STC's International Technical Communication Conference. They are both equivalent to second place in the category of complete periodicals. The competitions included magazines published inside and outside government.

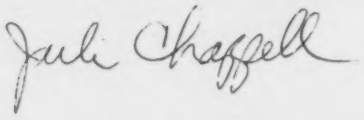
The society sponsors these contests for two reasons: to give credit to outstanding achievements and in doing so to foster good technical communication. However, we all know that regardless of the awards system—from the Nobel Prize to the pie-baking contest at the county fair—worthy achievements will sometimes go unmarked while a few dubious accomplishments receive laurels.

And thus, admittedly, the measure of this magazine cannot be taken in terms of whatever honors it may reap. These realities in no way diminish the delight those of us involved with DIMENSIONS share in having been recognized by our peers.

Whatever success or effectiveness DIMENSIONS has achieved or will acheive, the credit belongs to the many people who contribute to its production. Some are listed on the masthead page of each issue. Authors are generally "credited" with bylines. However, it is the management of the National Bureau of Standards that provides the opportunity for us to publish. It is the scientists and engineers at the bench who give us the material to write about and the cooperation we need to get the stories told. It is the people who serve on the DIMENSIONS Advisory Board who guide us in policy matters and support us in editorial efforts. The names of the current board members appear here in the magazine for the first time.

I personally want to thank all of these people and the design-production staff at the Department of Commerce for making this magazine possible. Being editor has been a challenging and rewarding experience.

Now looking to the future, I hope we can become more effective in communicating the message of the National Bureau of Standards to the people who can benefit. I invite our readers to help by letting us know what we do right and what we do wrong. Through constant effort to improve and periodic evaluation, we can "win" our goals in a true sense.



Juli Chappell
Editor, DIMENSIONS/NBS

DIMENSIONS NBS

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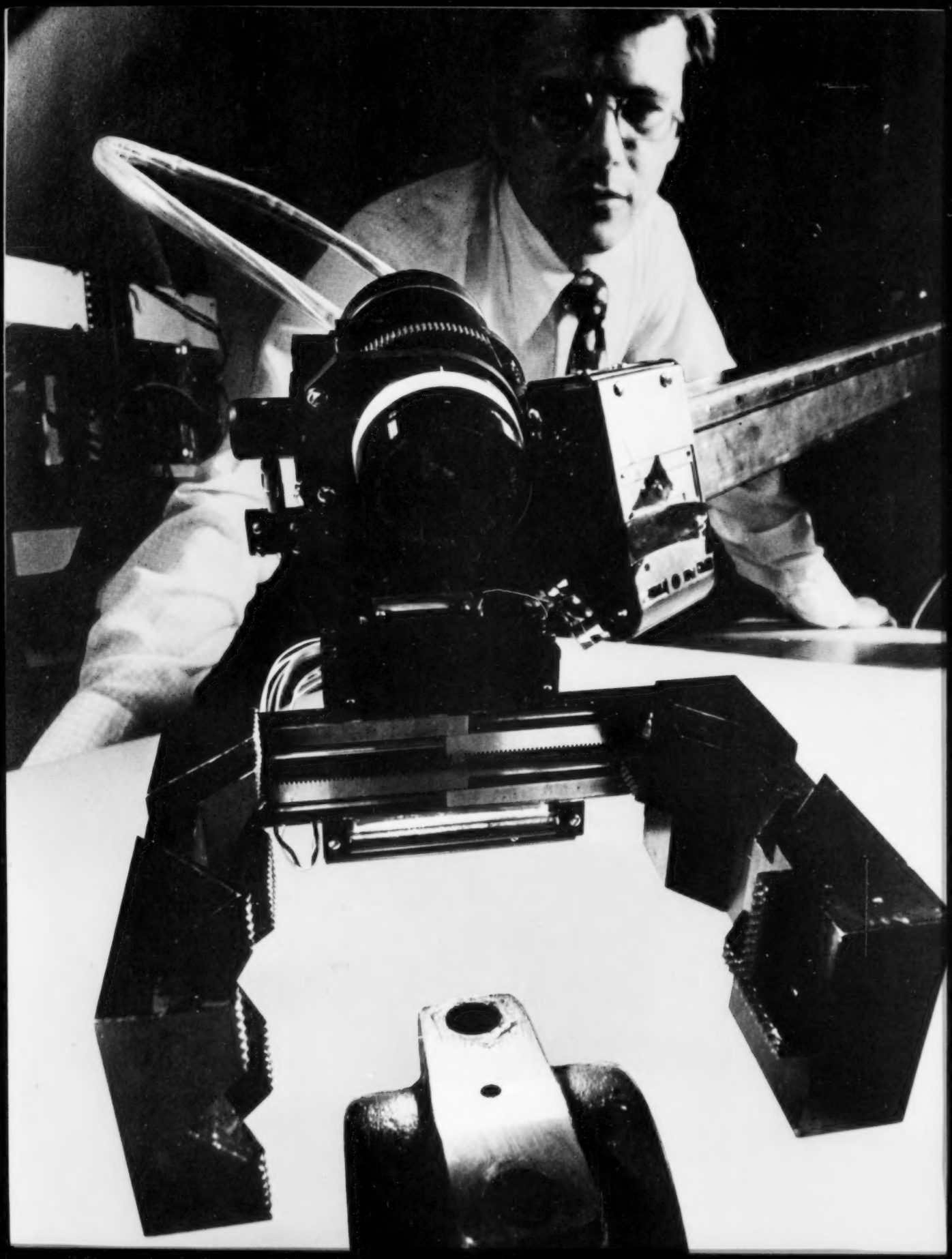
Contents

ARTICLES

INTERFACE

UPDATE



Giving a Robot the EYE

by Michael Baum

FANS of *Star Wars*, you may be in for a shock. Unlike their clear-sighted fictional counterparts, robots of the real world are, in the main, totally blind.

There is hope for the future, however. Though few, some systems already exist for endowing robots with at least simple powers of sight. One of the newest has recently been demonstrated by researchers at the National Bureau of Standards—a system intended for industrial robots.

The NBS roboticists hope that their "eye," built with a microprocessor, a solid-state TV camera, and a strobe light source, can be developed into a low-cost, effective system that will allow industrial robots to locate objects anywhere in their range of operation and adjust themselves to grasp the object from the proper angle—all talents of the NBS prototype.

Unlike its fictional colleagues, the typical industrial robot—a vise-like hand and rotating wrist on the end of an extendable arm—is quite limited in what it can do. Such machines are used to perform simple, repetitive tasks, especially in environments that are dangerous to human workers.

They can greatly improve efficiency and quality control in a factory, but because robot systems are so inflexible, they have limited use outside of large, mass-production operations. The typical robot, for example, can only pick up objects which have been left in precisely the place and orientation that the robot expects. Any part positioned slightly off-center may be shoved aside or crushed by the robot.

The NBS system is one of a handful of attempts in the United States and abroad to solve this problem by giving robots a crude sense of sight that can be used to guide the robot hand to the proper object—even if the target is not precisely where it should be, or even if it is at some totally random location.

Baum is a writer and public information specialist in the NBS Public Information Division.

To give their robot vision, the NBS team under Dr. Gordon VanderBrug in the Bureau's Center for Mechanical Engineering and Process Technology mounted a small, solid-state television camera on the robot's wrist, looking down between the machine's two "fingers." Somewhat near-sighted, the robot can only see for a distance of about one meter. A strobe light, mounted just below the wrist, flashes a narrow plane of light outward from the robot hand at the command of the computer which controls it. The robot "sees" objects in its field of view as a narrow line of light across the object.

From the position of the line in its field of view and the apparent shape of the line, the robot deduces how far away the object is, and at what angle and orientation. If the robot is not in the right position to pick the object up, it will move to a new location, take another look, and try again.

A special feature of the NBS robot is in the innovative use of a flash gun to provide light for the TV "eye." A special feed-back system which compares the TV image, frame by frame, allows the robot to control the timing and intensity of the flashes to bring the optimum amount of light to the camera. The system can also filter out background light electronically to obtain clearer images, allowing the robot to function under a variety of lighting conditions.

The researchers are now working at refining the capability of the robot to distinguish between different kinds of objects and at increasing the ease with which the system is programmed for different tasks. □

The NBS robot tries its newly developed vision system under the watchful eye of computer scientist Dr. Gordon VanderBrug. The bar of light across the bearing block is produced by a strobe light mounted under the robot "hand" and is "seen" by the TV camera above the hand The computer control uses the apparent shape and position of the bar of light as it hits an object to judge the position and orientation of the object.

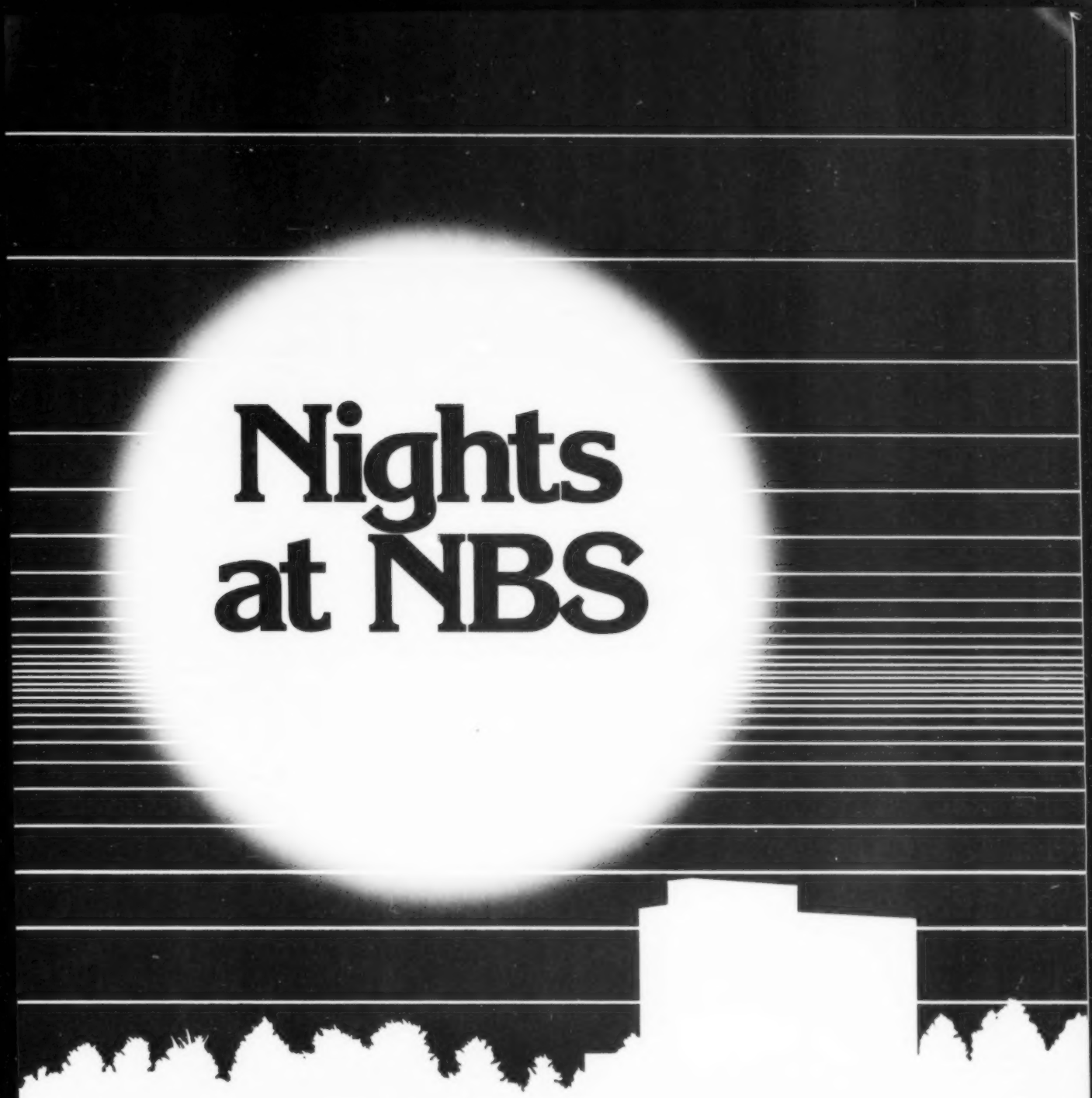
Arabian Days &

A unique solid block masonry building has been constructed inside one of the Bureau's environmental chambers and is being subjected to temperature conditions representative of the climate in Saudi Arabia.

by Mat Heyman

A new energy research project will soon bring the heat of a desert summer to the National Bureau of Standards. The extreme temperatures will be generated and contained within a three-story environmental test chamber at the Bureau as part of a cooperative industry-NBS research undertaking to verify the thermal character-

Heyman is a writer and public information specialist in the NBS Public Information Division.



istics of a specially built prototype desert structure.

The project at NBS is a joint effort sponsored by the U.S. architectual and engineering firm of Skidmore, Owings & Merrill (S-O-M) in association with the King Abdul Aziz University in Saudi Arabia. The NBS Center for Building Technology, the Concrete Masonry Association, the Brick Institute of America, Dow Chemical Company, and several other manufacturers are participating in the project.

The tests are expected to help S-O-M validate its computer models for predicting how the building and its thermal systems will react in the Saudi desert conditions. The firm is designing a number of buildings for the King Abdul Aziz University and is particularly interested in the ability of thick walls to moderate temperature swings within the living space and cut down on peak period air-conditioning needs.

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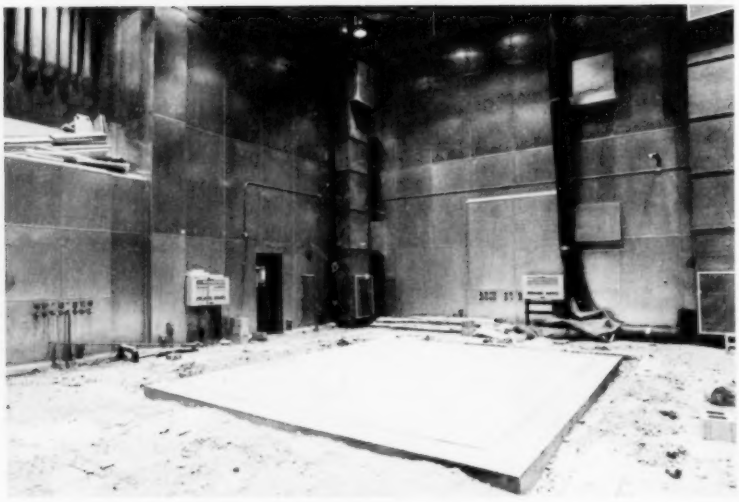

The largest of seven NBS environmental test chambers is shown above during early construction of the prototype building (At bottom right is the completed solid block masonry building.) Climatic conditions in the chamber can be varied from −45 °C to 66 °C (−50 °F to 150 °F) with humidity control.

NBS will be using the test structure to support the Bureau's continuing research on air leakage, indoor air quality, and infrared thermography techniques as they relate to energy conservation. The test results will also give U.S. engineers better information about heat transfer in massive and heavily insulated buildings. For instance, the research should provide insight into how the thick walls will store solar heat in the winter.

A unique solid block masonry building has been constructed inside an NBS environmental chamber and is being subjected to temperature conditions representative of the climate in Saudi Arabia, where daily temperatures range from 26-47 °C (79-116 °F) in the summer and 16-29 °C (60-85 °F) on winter days. The temperature and humidity in the chamber will also be adjusted to reflect somewhat different conditions typical of some regions in the southwestern United States. Winters in those U.S. areas are colder than the days and nights in Saudi Arabia, with daily temperatures ranging from −10 °C to 5 °C (15-40 °F).

The wall sections of the heavily instrumented building consist of 1.25 centimeters (0.5 inch) of plaster, 20 cm (8 inches) of high-density solid concrete block, 7.5 cm (3 inches) of urethane insulation, an air space, and a brick face on the outside. The roof consists of precast concrete panels with 10 cm (4 inches) of urethane insulation along with concrete pavers over a waterproof membrane.

Air and surface temperatures, humidity, heat flow and air leakage will be measured through a variety of tests reflecting different outdoor temperatures, window shadings, room occupancies, lighting conditions, and solar heat gains. NBS infrared thermography equipment will be used to show relative hot and cold areas by providing infrared pictures to researchers.

The research, which will continue through midsummer, is being conducted through the NBS Research Associate Program, a mechanism which enables technical specialists from U.S. firms and professional organizations to work at NBS temporarily in order to carry out projects of mutual interest. S-O-M is sponsoring a Research Associate to assist in this project. (Further information about this program is available from the Industrial Liaison Officer, A402 Administration Building, NBS, Washington, D.C. 20234).

The NBS Center for Building Technology performs research in a broad range of building-related areas, including extensive work on energy conservation in buildings. The environmental chamber being utilized in this project is one of seven test rooms used for predicting and evaluating the thermal performance of buildings, building components, and materials. This particular chamber, at 2100 cubic meters (70 000 cubic feet), is the largest of the Bureau's environmental facilities. Large enough to contain a full-size house, the chamber has been used to test a four-bedroom townhouse, several mobile homes, Coast Guard life rafts, and refrigerated trailer trucks. □

COVER STORY

2000 Tips for summer energy savings

IF you have just suffered through a long, cold winter and can't bear the thought of high utility bills during the heat of the summer, you will certainly be interested in the following list of tips prepared by the National Bureau of Standards. These suggestions are designed to help homeowners save energy and stay comfortable this summer. They are simple, and most of them can be applied at little or no cost. Their effectiveness has been demonstrated by NBS through long experience in the field of building research and, more recently, through studies of the energy efficiency of home appliances.

Most of these tips can be used universally throughout the United States, but the value of some of the suggestions changes with location and climate. For example, ceiling insulation is beneficial throughout the country to reduce either heating or cooling loads, or both. However, wall insulation will be of marginal value in those warm climates where winter heating needs are limited and summer outdoor temperatures fall below indoor temperatures at night. Floor insulation will actually increase the energy required for cooling in warm climates because it reduces the transfer of heat from the living space to earth.

Research at the National Bureau of Standards and elsewhere shows that some of the most important steps homeowners can take to save energy and stay comfortable during the summer months are reducing internal heat generation in the house, shading windows from solar radiation, and using whole-house fans to take advantage of natural temperature cycles and to provide ventilation. Turning up the thermostat on air conditioners is also important. Other tips on this list will help save energy and provide comfort as well.

turn page

1. Take advantage of the daily temperature cycle. When you are not using an air conditioner, open windows and draw cooler night air into the house and shut them during the hot part of the day. When using power fans in or near windows, draw air in from the coolest side of the house.

Investigate the possibility of installing a special whole-house fan. Typically mounted in the ceiling of the living area or in the outside wall of the attic, the whole-house fan primarily ventilates the living space. It provides a cooling effect by drawing a breeze through open windows and exhausting the air through openings in the attic. A whole-house fan is useful even in a house that has air conditioning; instead of using the air conditioner, use the fan (for outdoor temperatures up to 27 °C—about 80 °F). The increased air movement from the fan makes higher temperatures seem comfortable.

Recent NBS research has documented that whole-house fans can bring considerable energy savings when used this way. These studies suggest that whole-house ventilation may be used instead of air conditioning during a significant portion of the summer cooling season in the northern half of the United States, bringing energy savings of two-thirds or more. Even in the South, the energy savings may range from 10-66 percent over the cooling season.

2. In houses with central air conditioning, set thermostats at 26 °C (79 °F). Turning up the thermostats to this temperature rather than to 23 °C (73 °F) can bring substantial energy savings. The exact energy savings depend on the geographical location, but this 3 °C (about 6 °F) difference can mean savings of 18 percent or more.

3. Shade windows, especially from direct sunlight.

Awnings and overhangs are the most effective ways to reduce solar heat gain through windows. They must be properly designed, however, in order to prevent hot air from being trapped in the window area.

Blinds and draperies can reduce heat gain through windows by as much as 50 percent, but their effectiveness depends on how well they reflect solar radiation back through the window. Blinds and draperies should be light in color and opaque. Open-weave draperies are less effective—but do allow good ventilation.

4. Shade house from sun by planting fast-growing trees or large shrubs around the home. Deciduous trees (those that lose their leaves in winter) have the special advantage of providing summer shade while still allowing maximum exposure to the sun in cold weather.

5. Reduce heat generation in the house by limiting use of appliances which generate heat or moisture. This internally generated heat or humidity adds to the heat and humidity already in the house, making occupants uncomfortable. It also places an extra burden on the air conditioning system if it is on. By limiting use of appliances and lighting, homeowners can reduce the burden on their air conditioners. And since appliances cost money to operate, limiting their use cuts down on operating costs as well—a double benefit. Several common sense steps can be taken:

Turn off lights when they are not needed. Take advantage of natural daylight (not direct sunlight) from windows whenever practical, and use lighter colors on interior wall surfaces to reflect light more effectively. Use the most efficient and practical light sources. Fluorescent tubes produce more light than incandescent lamps for a given amount of electricity consumed, and they therefore generate less heat. But from an economic point of view, it is not a good idea to turn fluorescent lights off and then on again if you leave the lighted area for only very brief periods of time (up to 10 minutes or so). Repeated starting of fluorescent tubes shortens their lifespan.

Turn off television sets, radios, phonographs, and other appliances when they are not being used. Pull the plugs on all instant-on appliances such as televisions when you don't plan to use them for several days. (These appliances have power transformers that draw current even when the appliance is switched off.)

Make sure that refrigerator or freezer door seals are airtight and that their condensing coils are clean for good air flow. Avoid unnecessary or prolonged door openings.

Avoid using the cleaning feature of self-cleaning ovens at times when air conditioning loads are heavy. Instead, operate the self-cleaning feature late at night or early in the day, when demand on electrical utility systems is lowest.

Try to confine heavy use of cooking ranges and shower facilities to the cooler morning or evening hours. Cooking food on the range top is more efficient than preparing it in the oven. When using the oven, cook several dishes or whole meals at the same time. Use cooking pots of the same size as the stove burner or heating coil. Use covered pots and low fires whenever possible, especially when boiling. Not only is this more efficient from an energy point of view, but it prevents that unwanted

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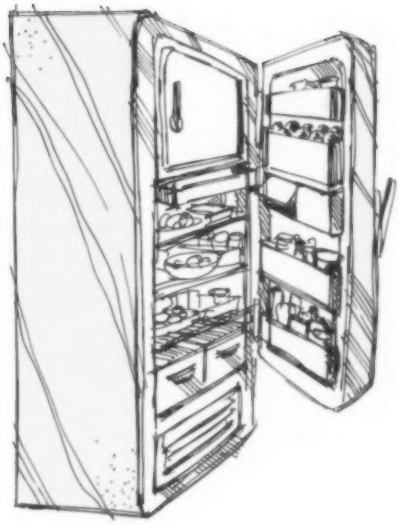
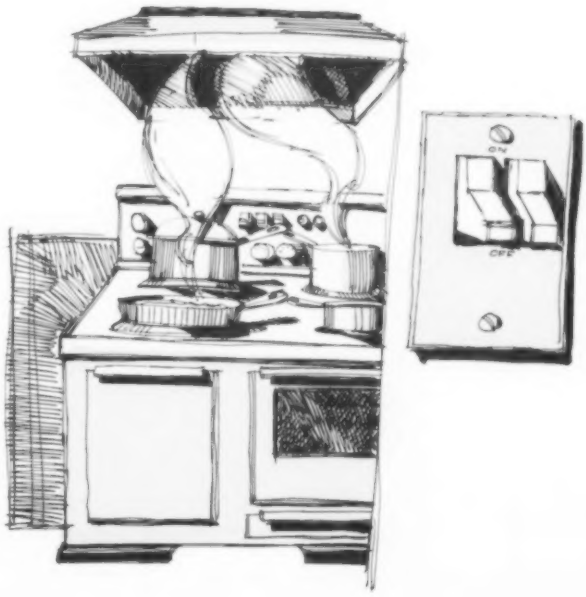
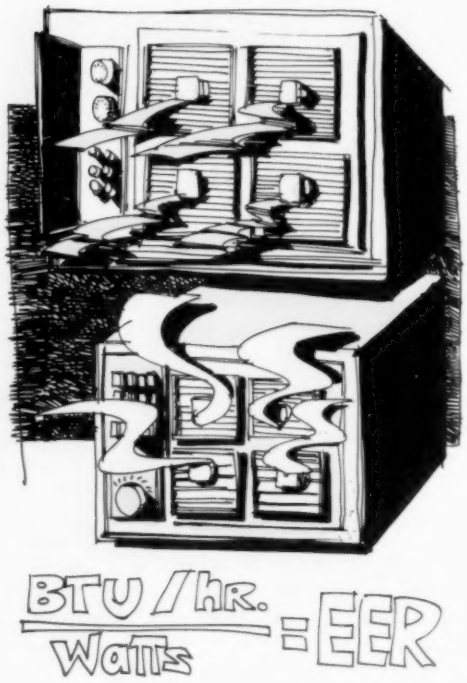




heat from escaping into the kitchen. Keep oven doors closed when cooking and check the oven gasket seal to make sure that heat is not leaking into the room.

6. If you are generating a large amount of water vapor or heat due to cooking, bathing, or washing, operate kitchen or bathroom exhaust fans (if they are vented to the outside) rather than opening windows when the air conditioning is on. Close off rooms in which exhaust fans are used in order to prevent air conditioned air from being exhausted to the outside. Remember to turn off exhaust fans as soon as the job is completed.

7. When shopping for a room air conditioner, look for energy efficiency along with price. Try to select one with a cooling capacity that matches your room's needs. If the cooling capacity of a room air conditioner is too small for the room where it will be used, it will not do an adequate job of cooling. If it is larger than necessary, it will probably be more expensive to purchase and may not dehumidify effectively. It is difficult to estimate the proper size without a thermal analysis of the specific room and location. Remembering that cooling capacity is typically expressed in Btu's per hour, here is a good rule-of-thumb you can use: For rooms with outside walls exposed to full sun, multiply the room's square footage by 30; for rooms with outside walls in full shade, multiply the square footage by 15.



Once you find what cooling capacity you need, buy the most energy-efficient models. To compare efficiency among different units, divide the Btu's per hour by the power in watts that it uses. This gives the Energy Efficiency Ratio (EER). Some manufacturers' labels may already give you this information, and by the 1980 cooling season, the new ENERGY-GUIDE label will appear on all room air conditioners. This label will show not only the EER for that unit, but also the EER's of the least efficient and most efficient units in that size range. Carefully consider those units with the highest EER for a given size. Even if the price is slightly higher, the extra efficiency means you will use less energy and have lower operating costs.

8. Central air conditioning systems generally provide the most effective and economical means of total house cooling. However, individual room units may be more economical, from the standpoint of both initial investment and operating cost, if air conditioning is required in only a few areas such as bedrooms. When considering the installation of central air conditioning, seek expert advice concerning the size of the air conditioner unit.

If you plan to install a central air conditioner, remember that insulation, solar shading, and other energy-saving measures will reduce the cooling load. The central air conditioner can therefore have a smaller cooling capacity, which means a lower initial cost as well as lower utility bills. (It is better to buy a slightly undersized unit than one that is oversized.)

9. Operate air conditioning equipment efficiently.

For individual or window units, if the circulating fan has more than one speed, run it at lower speeds in mild weather. Because most houses have enough natural air leakage for ventilation purposes, the outdoor air damper should be closed for greater effectiveness and economy; it can be opened to speed up removal of cooking or tobacco odors. Turn the unit off if rooms are unoccupied for several hours.

Check filters for dust or lint every 30 to 60 days and clean or replace as necessary. Allow free circulation around the condenser by keeping shrubbery trimmed.

10. Insulate around air conditioning ducts in the attic, and check to make sure that there are no leaks. Escaping air indicates that retaping is needed at duct joints. Special insulating duct wrap in layers of 5 cm (2 inches) or ordinary mineral fiber batts can be used. Avoid crushing the insulation because this lowers its resistance to heat flow. A vapor barrier is required around the outside of the insulation used in this way in order to prevent condensation on the ducts themselves, so you may prefer to buy the ready-made wrap.

11. Insulate hot water storage tanks and bare pipes, which can give off heat and increase cooling requirements. Also consider reducing hot water temperature to 50 °C (around 120 °F). If you have a dishwasher, you will need water at 60 °C (140 °F). Remember: there are two thermostats on most electric water heaters—turn them both down.

12. Keep excessive hot outdoor air outside. Weatherstrip windows and doors at moveable joints, and caulk cracks and openings at their frames. Seal all cracks and openings on the inside of the exterior walls, including those around electrical and plumbing penetrations and heating and cooling ducts.

13. Close and seal all openings into the attic from occupied space, including cracks around attic doors.

14. Keep all windows and outside doors shut and keep storm windows and doors in place when the air conditioning system is turned on.

15. Close off rooms and closets not in use. If the house has a fireplace, close its damper.

16. If you are building a new home or putting a new roof on your present home, consider using light-colored paints and roofing materials (if you live in an area where your cooling loads are greater than your heating loads). A dark-colored exterior surface may get as much as 33 °C (60 °F) hotter than the air temperature in direct sunshine, while the same surface, painted white, would only be about 11 °C (20 °F) above the air temperature. It is especially desirable to have the roof color as light as possible.

17. If an addition to the house is being made, try to orient the rooms and windows to take best advantage of prevailing wind conditions and sun orientation. In general, a north-south orientation of windows is best, especially if some shading devices —either trees or overhangs—can be used on south facing windows.

18. Think about adding insulation to the walls and ceiling of your house if you are in the southern part of the country where it is hotter outdoors even

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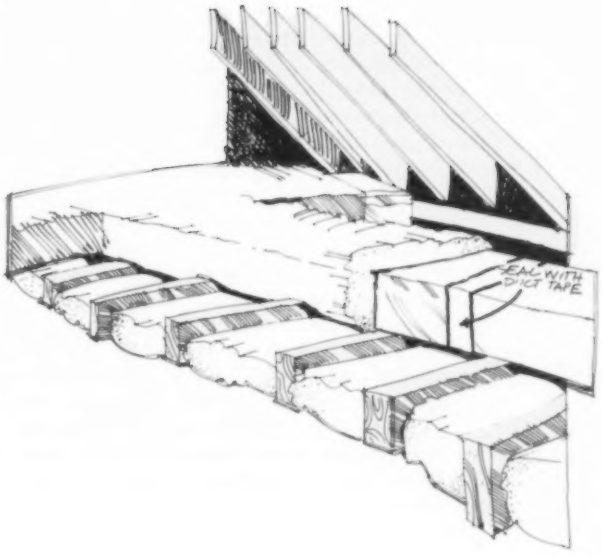
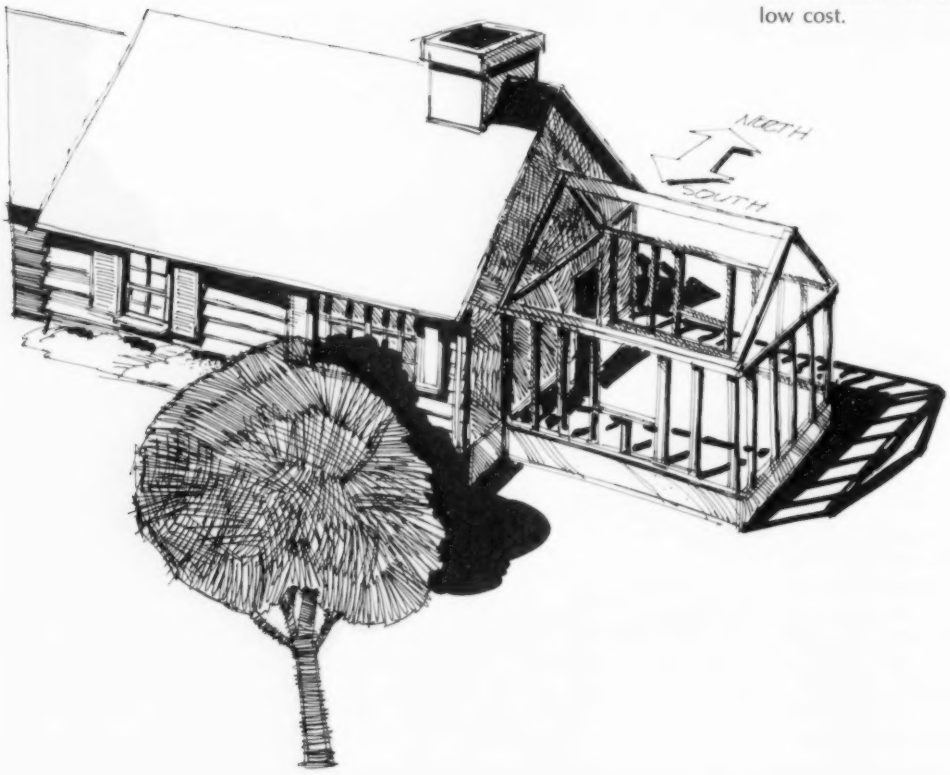


at night. If you are in the cooler, northern areas of the United States, adding insulation will usually be effective in saving energy in the winter even though the summer savings will be marginal. (Your decision about how much insulation is appropriate should be based on your relative heating and cooling needs. A revised version of the popular NBS consumer guide, *Making the Most of Your Energy Dollars in Home Heating and Cooling*, is expected to be available by early fall to help in making this decision.)

19. While adequate ventilation is important to protect against winter moisture problems in your attic and adding natural attic ventilation may be a good idea, NBS research indicates that the air conditioning energy you save by using a powered attic fan (which ventilates only the attic) to reduce air conditioning loads would probably be offset by the fan's own energy use—provided you have a modest amount (10-15 cm, or 4-6 inches) of ceiling insulation.

The following formula will help you figure out how much ventilation is needed to prevent moisture buildup in the attic. If you have attic insulation with a vapor barrier or if half of your attic ventilation is near the roof and the other half is in the lower part of the attic, you should have about 0.1 square meter (1 square foot) of free ventilation area for each 30 square meters (300 square feet) of attic space. If you do not have a vapor barrier in your attic or if your vents are mostly at one level use twice as much ventilation.

20. Remember to take advantage of nature, even if the house has central air conditioning. It is possible to maintain a comfortable house in summer in many parts of the United States without relying on an air conditioning system. Take advantage of daily temperature cycles (see tip 1), using the night air to cool the house. The lowest air temperature usually occurs from midnight to just before dawn. In dry climates, evaporative cooling devices, which evaporate water to lower the temperature of a stream of outdoor air circulated through the house, can provide comfortable conditions both day and night at low cost. □



GOVERNMENT ADOPTS THREE COMPUTER INTERFACE STANDARDS

Three Federal computer standards that will help the U.S. Government cut the costs of new computer peripheral equipment have been approved by the Secretary of Commerce. They apply to the input/output channel level interfaces of all medium- and large-scale computer systems procured by the government.

These new standards will enable Federal agencies to procure magnetic tape peripheral equipment in a fully competitive manner. When accompanied by another standard, which was proposed in January by the National Bureau of Standards, these standards will also make possible fully competitive procurement of magnetic disk peripheral equipment. The Federal Government expects to save $61 million over the next 5 years through use of these standards.

Announced by NBS as Federal Information Processing Standards (FIPS) 60, 61, and 62, the standards were published in the *Federal Register* on February 16, 1979.

FIPS 60, I/O Channel Level Interface, defines the mechanical, electrical, and basic functional specifications of the channel level interface. FIPS 61, Channel Level Power Control Interface, defines the channel interface for power sequencing of peripheral equipment. FIPS 62, Operational Specifications for Magnetic Tape Subsystems, defines the use of the channel level interface for connection of magnetic tape peripheral equipment. Copies of the standards may be obtained from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, Virginia 22161 (Telephone: 703/557-4650).

These standards will become effective on December 13, 1979. After that date, Federal agencies will have to specify the standards in all requests for proposals, procurement solicitations, and orders for medium- and large-scale computer systems and peripheral devices to be connected as a part of these systems unless a waiver has been obtained from the Secretary of Commerce. Regulations concerning the specific use of these standards in Federal procurement will be issued by the General Services Administration.

The standards have been adopted under Public Law 89-306, the Brooks Act. This legislation mandates the development and issue of computer standards that promote the efficient and economic acquisition and use of computers by the Federal Government.

FIPS 60, 61, and 62 have undergone comprehensive analysis and public review. They were announced in the June 19, 1978, *Federal Register* (Vol. 43, No. 118, Page 26341), and public comments were invited. An informal public hearing to solicit public views on the proposed standards was held by NBS on August 11, 1978, and additional post-hearing comments were also invited. NBS carefully reviewed and analyzed all of the comments received along with other technical and economic information concerning the potential impact of the standards.

The full public record of analyses and comments concerning FIPS 60, 61, and 62 may be inspected and copied in the Central Reference and Records Inspection Facility, Room 5317, Main Commerce Building, 14th Street between E Street and Constitution Avenue, N.W., Washington, D.C. 20230.

NBS will develop a list of microcomputers, minicomputers, and other small systems that are excluded from compliance with these standards. This list, along with criteria and procedures for developing and maintaining the list, will be announced in the *Federal Register* within the next month.

A fourth channel level interface standard that defines the use of this interface for connection of magnetic disk peripheral equipment was proposed by NBS in the January 23, 1979, *Federal Register* (Vol. 44, No. 16, Page 4750). Copies of the proposed Federal Standard, Operational Specifications for Rotating Mass Storage Subsystems, are available from the director, Institute for Computer Sciences and Technology, National Bureau of Standards, Washington, D.C. 20234.

STAFF REPORTS

CRYOGENIC TEMPERATURE REFERENCE DEVICE AVAILABLE

Researchers at the National Bureau of Standards have developed a new temperature reference standard which should promote intercomparison of temperature scales and permit other laboratories to achieve the NBS cryogenic scale.

Robert J. Soulen, Jr. and Robert B. Dove, Temperature Measurements and Standards Division, B128 Physics Building, 301/921-2018.

Cryogenic temperature scales are now available which are quite accurate and which extend deep into the cryogenic region—as low as 0.5 K. However, no formal scale exists in the region below 0.5 K. In the hope of establishing a *lingua franca* by which experimental results from different laboratories involving the parameter "temperature" may be meaningfully compared, we have developed a compact device which provides five reference temperatures from 0.015 to 0.21 K.

This device, designated SRM 768, is now available* and consists of a self-contained assembly of coils and five samples which can be used to provide *in situ* temperature calibration. (See Figure 1.) Simple room temperature electronics readily permit the observation of the five narrow and highly reproducible superconducting phase transitions. These phase transitions have been assigned temperature values by means of primary thermometers used at the National Bureau of Standards. Provided that care is exercised in reducing the magnetic field acting upon the device, the user can confidently expect to achieve a temperature reproducibility and traceability to the NBS temperature scale of ±0.2 mK. Table 1 provides the salient information about SRM 768. Since the variation in transition temperature (T_c)-typically ±1 mK among different specimens of the same material—is larger than the reproducibility of a

* *From the Office of Standard Reference Materials, National Bureau of Standards, Room B311 Chemistry Building, Washington, D.C. 20234 for $1125.*

Figure 1—*SRM 768. The unit is composed of two similar parts, each one consisting of two or three samples bound in copper wires inside a pair of coils (primary and secondary). The four coils are connected in series opposition so as to minimize the total mutual inductance. The serial number of the unit (in this case, 7) is stamped on the end designed to attachment to a cryostat which is terminated with a 6-32 threaded stud. The threads are relieved near the body of the device so that it will bottom properly when screwed in, thereby establishing good thermal contact.*

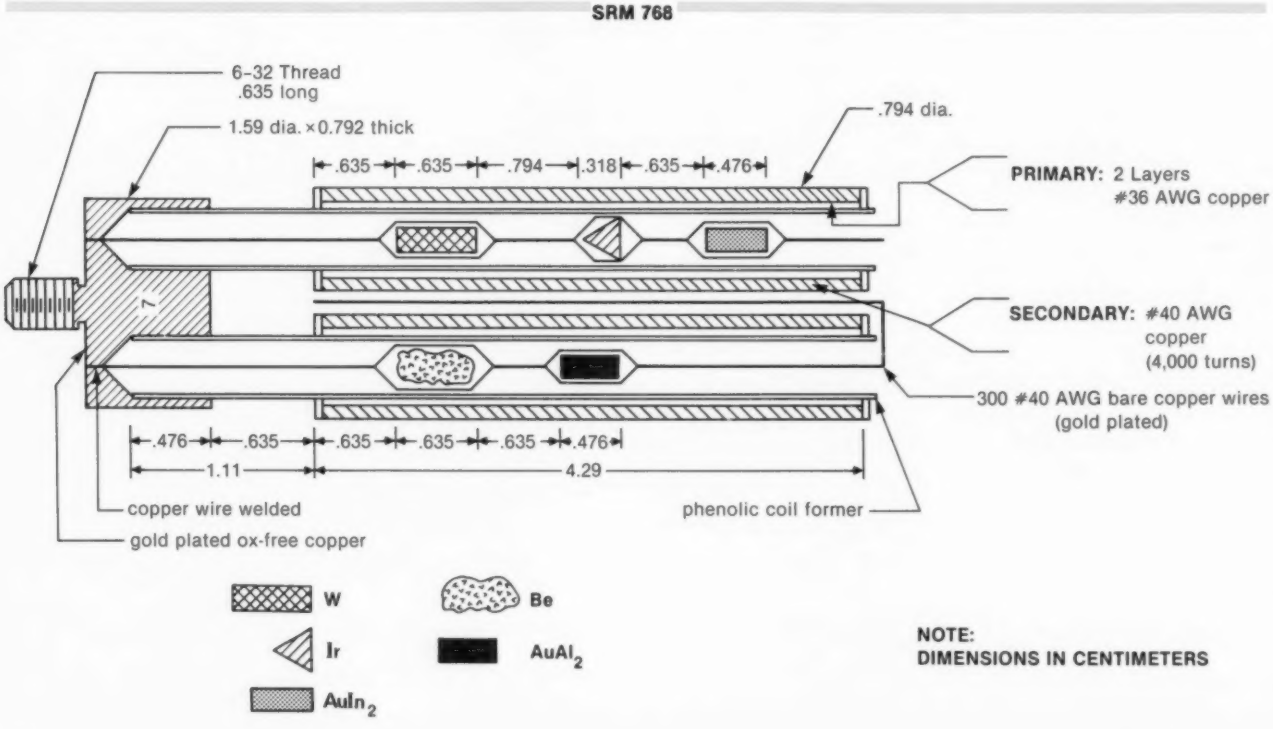


Table 1

SUMMARY OF PROPERTIES OF SRM 768

Material	Transition Temperature Will Lie Between	Typical Transition Width	Typical Reproducibility* Upon Thermal Cycling
	mK	mK	mK
W	15.0-17.0	0.7	0.20
Be	21.0-24.0	0.2	0.10
Ir	98.5-99.5	0.8	0.10
$AuAl_2$	160.0-161.0	0.3	0.10
$AuIn_2$	205.0-208.0	0.4	0.15

* The values given are the averages of the standard deviations of several samples.

RECOMMENDED OPERATING CONDITIONS

1) Peak-to-peak magnetic field applied in primary coil: 2.3 μT (23 mG) for W transition, 0.46 μT (4.6 mG) for the others.
2) Heating generated with above conditions: 1.8×10^{-9} W and 7.5×10^{-11} W, respectively.
3) Ambient magnetic field kept below 1 μT.

given sample (±0.1 mK), each SRM 768 unit is accompanied by a calibration certificate. This certificate specifies each T_c in the unit to ±0.1 mK on an NBS temperature scale which is believed to be thermodynamically accurate within a few tenths of a percent from 0.01 to 0.5 K.*

In many ways SRM 768 is similar to SRM 767, a device containing five superconductors whose transitions have been

* *This scale dubbed NBS-CTS-1 (NBS Cryogenic Temperature Scale-1) was obtained by intercomparing Co-60 gamma-ray aniosotropy and Josephson junction noise thermometers from 0.011 to 0.050 K. From 0.05 to 0.5 K the noise thermometer was used alone. The data obtained by these methods was then "smoothed" with a paramagnetic salt thermometer (cerium magnesium nitrate) to arrive at NBS-CTS-1. This scale is maintained at the NBS via secondary thermometers (germanium resistors) and two units of SRM 768 which were calibrated at the same time as the gamma-ray and noise thermometers. For a discussion of these thermometers, see H. Marshak and R. J. Soulen, Jr., Journal de Physique 39, C6-1162 (1978) and references therein.*

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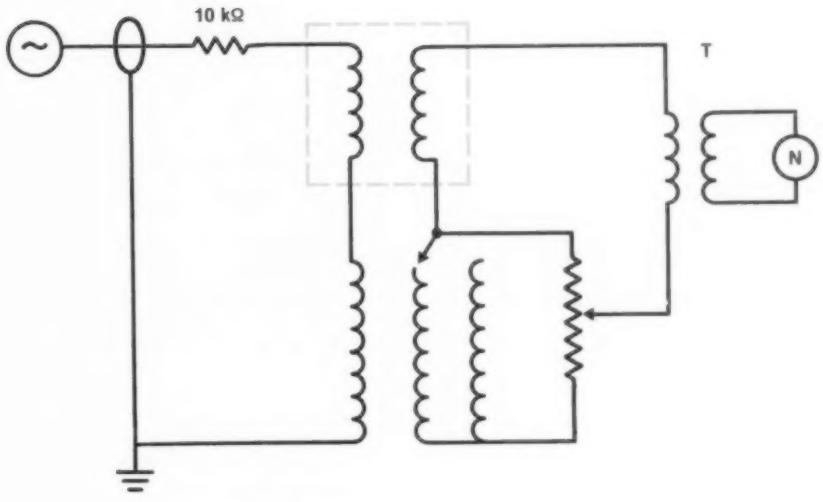


Figure 2—*Mutual inductance bridge for SRM 768. The circuit shown in dashes represents the SRM 768 coils at cryogenic temperatures which are actually four coils arranged in series opposition. A switch selects one of two secondary coils of the reference mutual inductance; the first (0.22 mH) is suited for use with SRM 768, the other one gives a mutual inductance of 5.1 mH for use with SRM 767. A ten-turn potentiometer (total resistance, 100 Ω) reduces the voltage developed by the standard mutual inductance until bridge balance is achieved. A transformer with a turns ratio of ≈ 90, couples the circuit to a phase-sensitive detector, N. Provision of a circuit to balance the small out-of-phase component of the voltage has not proved necessary.*

adopted as fixed points for EPT-76.* There are significant differences between them, however, arising chiefly from the requirement of better thermal contact for SRM 768.

The four leads from the device are connected to a mutual inductance bridge shown in Figure 2. The bridge is easily constructed from materials found in any electronics storeroom, and can be built in a few hours at a very moderate cost.

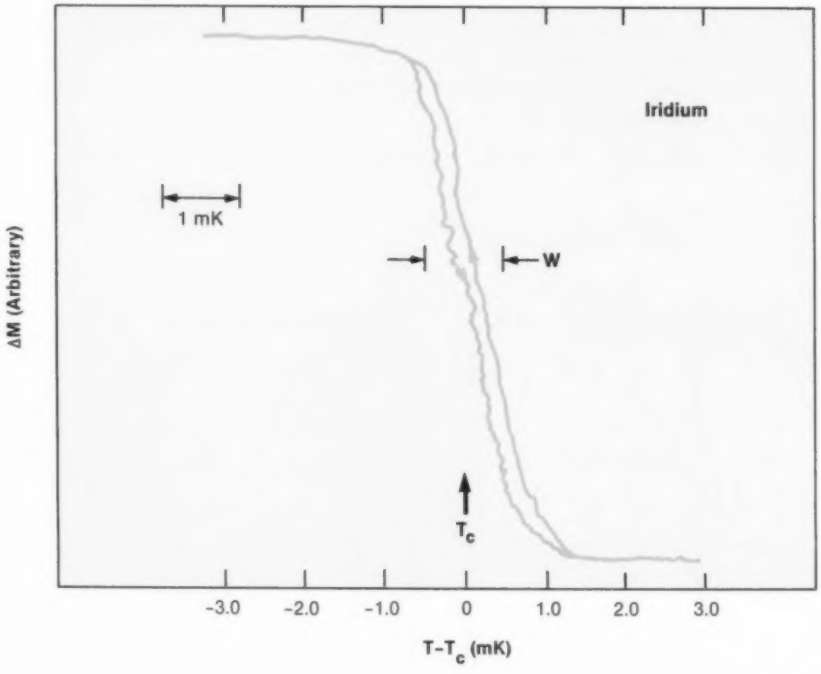
The superconductive transitions can be monitored easily using the circuit in Figure 2, with the precaution that neither the measuring field nor the local magnetic field should exceed 1 μT (0.01 gauss). A typical curve of a transition is shown in Figure 3. It is anticipated that the ease of use of these units and their reproducibility will improve cryogenic laboratory thermometry and facilitate inter-laboratory thermometric comparison.

SRM 768 should prove particularly valuable in calibrating ^{3}He-^{4}He dilution refrigerators, in determining the temperature reproducibility of physical phenomena, in calibrating various interpolation thermometers, and in determining the temperature stability of cryogenic equipment. By using SRM 768 to calibrate a working thermometer, the operator can easily maintain reproducibility of the laboratory temperature scale at the submillikelvin level. Also, the device will enable the user to examine the precision and stability with time of cryogenic equipment and thermometers, or reproducibility from experiment to experiment of temperature-dependent material properties.

The use of SRM 768 should thus provide a double benefit to thermometricians: Day-to-day reproducibility of an experiment can be determined at the submillikelvin level, and thermodynamic temperature values obtained at or near the fixed-point temperatures can be compared with those obtained by colleagues elsewhere without transporting equipment or personnel.

A more complete discussion of this SRM can be found in *NBS Special Publication 260-62* "SRM 768: Temperature Reference Standard for Use Below 0.5 K."

Figure 3—*Iridium phase transition. The change in mutual inductance ΔM as observed by the circuit in figure 2 is plotted in arbitrary units versus the output of an ac resistance bridge monitoring a calibrated germanium resistance thermometer. The transition temperature (T_c) is chosen as the midpoint of the transition, while the width W of the transition is defined as 80 percent of the change ΔM centered about T_c. This transition was plotted out in a time of approximately five minutes. The slight amount of hysteresis present is due to supercooling.*



* *The EPT-76 is a provisional scale of temperature intended to improve the International Practical Temperature Scale below 30K and to provide an international scale farther into the cryogenic range. For, further details, see "Toward a New Scale of Temperature" by James F. Schooley in September 1978 DIMENSIONS, pages 20-25.*

A METHODOLOGY FOR SELECTING INTERACTIVE COMPUTER SERVICES

NBS researchers have developed a practical approach for comparing the performance of interactive computer network services using ranking and selecting statistical techniques. Federal and private sector computer users should find this methodology useful in developing procedures for selecting interactive computer services based on evaluation of measurable performance data.

Sandra A. Mamrak and Paul D. Amer, Center for Computer Systems Engineering [*For further information, write or call Marshall Abrams, B226 Technology Building, 301/921-3517*].

Selection of an interactive network service is a decision that may involve millions of dollars for large government and industry users. A report by Marshall D. Abrams, Ira W. Cotton, Shirley Ward Watkins, Robert Rosenthal, and Don E. Rippy (*The NBS Computer Network Measurement System*, DIMENSIONS/NBS, June 1978) described techniques for collecting and analyzing measurable data about interactive computer networks.

Our study, *A Methodology for the Selection of Interactive Computer Services* (NBS Spec. Pub. 500-44 by Sandra A. Mamrak and Paul D. Amer), documents an experiment that applied ranking and selecting statistical techniques to data collected by the NBS Network Access and Network Measurement Machines. These techniques can be applied by users in the selection of interactive computer services to help answer the questions "Which computer service is the best?" or "How do the services rank from best to worst?"

The Selection Process

Figure 1 is a model of the computer service selection process for evaluating services according to performance criteria. Selection criteria are both measurable and non-measurable, desirable and mandatory. Criteria such as system response time are measurable. Others, such as ease of system use and coherence of system documentation, are not. A mandatory criterion is defined as a performance requirement which must be satisfied by the computer services being considered for selection. Desirable criteria, on the other hand, are those which are not absolute requirements for system acceptance, but which make the implementation of the purchaser's work easier.

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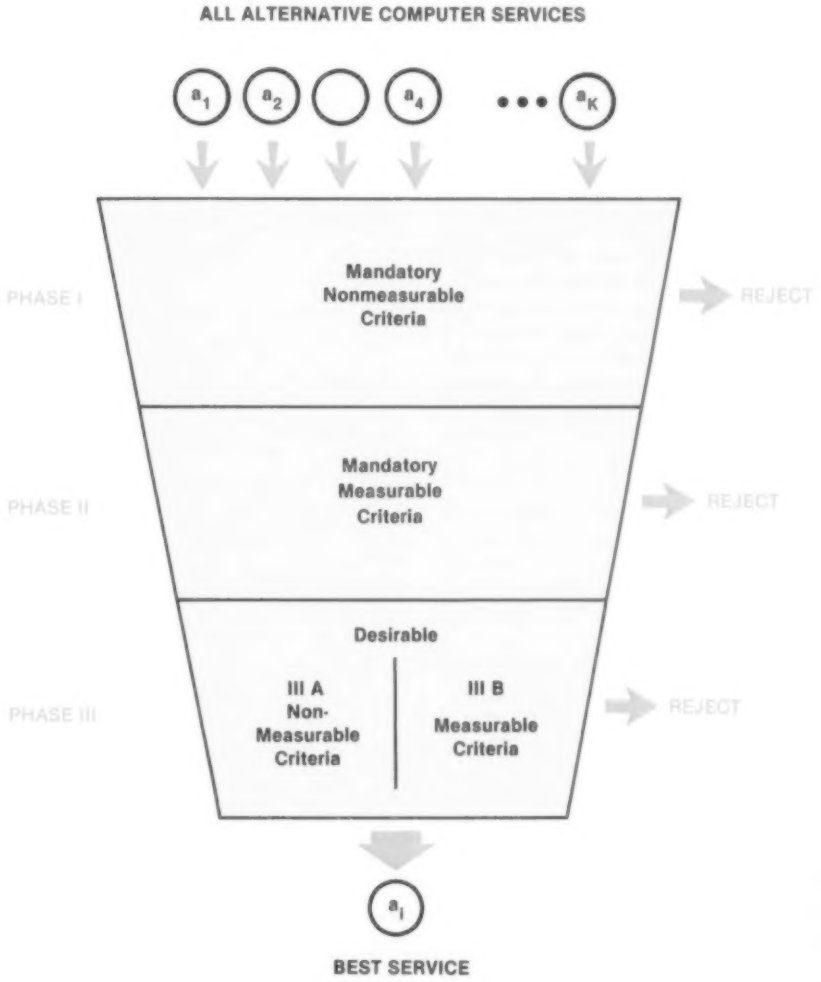
Figure 1—*Computer selection model.*



Performance criteria can be classified as Mandatory Nonmeasurable (MN), Mandatory Measurable (MM), Desirable Nonmeasurable (DN), and Desirable Measurable (DM). Examples of each class of criteria are provided by Table 1.

The decision about how many and which performance factors are most important in an evaluation is a policy issue. One user may view system reliability as the overriding consideration in a system selection effort, while another user might view cost and response time for short edit commands as the most important factors. Usually some combination of various measures of system response time and system costs is used in the selection process.

In phase 1 of the selection process, all of the systems which do not satisfy the MN criteria are eliminated. Similarly in Phase II, failure to satisfy a single MM criterion results in a service's elimination. Phase III consists of two parts, Phase III A for the application of DN criteria and Phase III B for the application of DM criteria.

The selection methodology deals with the collection and analysis of relevant measurements in Phase II and Phase III B. The components of this methodology are as follows:

1. Determination of performance criteria which will form the basis of a service comparison,
2. Development of a user scenario that is representative of a projected workload,
3. Translation of a scenario into individual scripts executable on the respective systems under test, and
4. Collection and analysis of the data required for a comparison.

Table 1

EXAMPLES OF PERFORMANCE CRITERIA

Type	Example
Mandatory Nonmeasurable	1. The system must be fully delivered and operational no later than September 1, 1979.
	2. Timesharing service must include FORTRAN, Basic, Lisp, SNOBOL, and editing facilities.
Mandatory Measurable	1. The mean-time-to-failure for a specific one month period must be greater than 4 hours.
	2. 95 percent of all trivial command response times must be less than 1 second.
Desirable Nonmeasurable	1. It is desirable that the system include Pascal and COBOL facilities.
	2. It is desired that the system provide a text editing capability.
Desirable Measurable	1. It is desired that the system provide a mean turnaround time for the benchmark run of 5 minutes or less.
	2. It is desired that 95 percent of all trivial command response times be 0.5 second or less.

Determination of Performance Criteria

More than 50 performance measures describing the time, length, rate, and ratios of user-computer interactive behavior have been identified. Three measures that are particularly important to the evaluation and selection process are

Response time: defined as the elapsed time from the last user key stroke (which terminates a service request) until the first meaningful system character is displayed at a user's terminal.

Interactive turnaround time: measured as the elapsed time required to complete a given sequence of tasks in an interactive mode.

Cost: based on the various resources used during an interactive session, such as CPU time, connect time, and so on.

Development of the User Scenario and Generation of Scripts

A "scenario" is a functional description of an interactive benchmark which is to be run and measured on each service being compared. The scenario developed for comparison studies should closely reflect the functional requirements of the real workload for interactive program development such as use of compilers and editors, transaction processing, and remote job entry. The comparison methodology requires that about 100 measurements be made for each comparison criterion and that the values of the measurements be independent and not affected by the value of previous measurements. Therefore, the scenario must be long enough to accurately represent the workload, but not so long that it is excessively costly to run the tests.

The general scenario commands must be translated into commands that are compatible in the system under study. Small sections of programs which are not directly transportable across heterogeneous computer systems can be modified, but care must be exercised to ensure that the scripts which are executed on different systems are as similar as possible.

Data Collection and Analysis

Statistical techniques for comparing performance data and ranking computer services are based on sample means, sample percentiles, or sample proportions. The analyst selects mean, percentile, or proportion statistics for comparison—depending upon the objectives of the comparison study, the statistical properties of the data, and the statistical requirements of the selection methodology.

For example, when the service turn-

around time and cost are of particular interest, means are often used for comparisons. When response time, which tends to have exponential-like distributions, is important, percentiles or proportions should be used.

Both percentile and proportion statistics rely on the cumulative distribution of a single performance criterion. The difference lies in whether an analyst prespecifies a desired percentage value or a desired comparison criterion value. In a comparison based on percentiles, a percentage is predetermined. In an example from the NBS report, results are as follows:

"If computer service A has exactly 90 percent of its response times less than 3 seconds, and computer service B has exactly 90 percent of its response times less than 3.5 seconds, then A is better than B," when "90 percent" is prespecified by the analyst.

In a comparison based on proportions, a criterion threshold is prespecified. Results are as follows:

"If computer service A has exactly 80 percent of its response times less than 3 seconds, and computer service B has exactly 87 percent of its response times less than 3 seconds, then B is better than A," where "3 seconds" is prespecified by the analyst.

The step-by-step procedures explained in NBS Spec. Pub. 500-44 cover selection of services satisfying a mandatory requirement (based on proportion statistics) and selection of the best service based on performance criteria expressed in terms of mean, percentile or proportion statistics.

This methodology specifies the best system only with respect to one performance criterion at a time. For example, it will guarantee, with a certain maximum probability of error, selection of the best system with respect to script turnaround time, or selection of the best system with respect to response time for short edit commands, and so on. The task of integrating the information provided is left to the analyst. Typically, a simple policy which defines the overall best computer service as that one which ranks best with respect to the greatest number of single criteria is satisfactory. A weighted function of several criteria could also be used for final selection if the function was based on information regarding which computer service was the best with respect to each criterion rather than on a relative ranking of the computer services from best to worst.

RIVER SEDIMENT AND URBAN PARTICULATE SRM'S AVAILABLE

The Office of Standard Reference Materials announces the availability of two new Standard Reference Materials for environmental analysis.

Two new NBS Standard Reference Materials (SRM's), SRM 1645, River Sediment and SRM 1648, Urban Particulate Matter —are intended for use as reference materials by scientists making environmental measurements and developing analytical techniques.

The reliability of the chemical analysis of sediments from bodies of water, such as is required for environmental impact studies, for example, is unknown, although discordant results are partly due to sampling problems as well as to analytical uncertainties. Concern about this situation by many analysts and especially by the Environmental Protection Agency (EPA) has prompted the latter to sponsor a project at NBS to provide this Standard Reference Material. The availability of such an SRM will make possible the evaluation of methods used for the analysis of key substances, and stimulate the development of new techniques where existing ones are inadequate. Above all, the SRM should verify the accuracy of analytical values obtained for environmental impact studies used for the basis of environmental decisions and minimize controversy presently caused by discrepancies in analytical data. While initially intended to help EPA in its regulatory problems, the materials are expected to be useful both for quality control purposes and as general reference materials for analytical research and development.

The River Sediment was obtained from the Indian Harbor Canal. It is certified for cadmium, copper, lead, manganese, mercury, nickel, thallium, thorium, uranium, vanadium, zinc, chromium, and iron. Method dependent measurements of nitrogen, phosphorus, oil and grease, and chemical oxygen demand are also provided, as well as the matrix components SiO_2, MgO, Al_2O_3, and CaO.

The material used for SRM 1648 Urban Particulate Matter, is a portion of a large lot of material collected over a period of 1½ years in the vicinity of St. Louis, Missouri, and should be representative of dust found in many urban areas. SRM 1648 is intended for use as a reference material by scientists making environmental measurements and developing analytical techniques. Because this SRM represents a large homogeneous quantity of urban dust, it should prove useful to scientists who wish to study the environmental impact of urban dust.

This SRM is certified for arsenic, cadmium, chromium, copper, nickel, zinc, uranium, iron, and lead content. Method dependent information is also provided for nitrate, ammonium, sulfate, and the freon-soluble components.

SRM 1645 may be purchased from the Office of Standard Reference Materials, B311 Chemistry Building. NBS, Washington, D.C. 20234, for $93 for 70 grams and SRM 1648 for $88 per 2-gram unit.

CONFERENCES

For general information on NBS conferences, contact JoAnn Lorden, NBS Public Information Division, Washington, D.C. 20234, 301/921-2721.

TECHNOLOGY TRANSFER

The semi-annual meeting of the Federal Laboratory Consortium for Technology Transfer (FLC) will be hosted by NBS in Gaithersburg, MD, May 15 to 17, 1979. Representatives from the Consortium, which includes over 180 Federal laboratories, will discuss current National research in science and technology and ways this research can be used to help solve problems faced by private industry, and Federal State and local governments.

Discussion topics will include latest developments in technology transfer techniques to legislative branches and public interest groups, a report from the Office of Technology Assessment, and recommendations from the task force on Federal Policy and Industrial Innovation. Congressman Christopher Dodd (D-Conn.) will give a keynote address on Wednesday, May 16 at 9:45 a.m. The meeting is open to the public.

SYNCHROTRON RADIATION INSTRUMENTATION CONFERENCE

The synchrotron radiation laboratories of the United States will hold a special national conference on new instrumentation, measurement, and design techniques for synchrotron radiation. The three-day meeting, beginning June 4, 1979, will be hosted by the National Bureau of Standards at the NBS facilities in Gaithersburg, Maryland.

A unique form of radiation running from infrared wavelengths up through visible light and ultraviolet and into the x-ray region, synchrotron radiation is produced by electrons trapped in magnetic fields and accelerated to high velocities. The energy lost to this radiation was at one time simply a "nuisance" to particle physicists. That situation changed in the 1950's when several laboratories began experimenting with synchrotron radiation as a valuable source of radiation in regions where good sources were scarce —particularly the ultraviolet and x-ray wavelengths.

A synchrotron radiation source has several attractive features, including the strength of the beam, its natural polarization and narrow focus, and the fact that the radiation is continuous across a broad spectrum.

Synchrotron light has been used in fields as diverse as crystallography, catalysis chemistry, structure analysis, medical diagnostic radiology, and x-ray astronomy.

Today, there are three functioning synchrotron radiation sources in the United States, the Synchrotron Ultraviolet Radiation Facility (SURF-II) at NBS, the Stanford Positron Electron Accelerating Ring (SPEAR) at the Stanford Synchrotron Radiation Laboratory, and the Tantalus I at the University of Wisconsin Synchrotron Radiation Center.

In addition, two new facilities are under construction—the Cornell High Energy Synchrotron Source (CHESS) at Cornell University and the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory.

Together, these five laboratories are sponsoring the National Conference on Synchrotron Radiation Instrumentation to explore some of the new instrumentation and techniques (and problems) developed in this rapidly growing field.

Topics highlighted during the conference will include source and facility design; wigglers, undulators and other facets of beam control; thermal dissipation problems; radiometry; radiation damage and contamination of optical components; gratings and mirrors; monochromators and spectrometers; and radiography and lithography.

Invited speakers will include scientists from some of the major European synchrotron facilities and research groups, including the DESY (Hamburg, Federal Republic of Germany), LURE (Orsay, France), and the European Molecular Biology Laboratory (EMBL).

For further information contact: David Ederer, A251 Physics Building, NBS, 301/921-2031.

Those interested in attending the conference should contact: Kathy Stang, B348 Materials Building, NBS, Washington, D.C. 20234.

CONFERENCE CALENDAR

May 15-17

FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER, SEMI-ANNUAL MEETING, NBS, Gaithersburg, MD; sponsored by NBS and the Federal Laboratory Consortium; contact: James Wyckoff, A400 Administration Building, 301/921-3814.

May 17

TRENDS AND APPLICATIONS SYMPOSIUM, NBS, Gaithersburg, MD; sponsored by NBS and IEEE; contact: Shirley Watkins, B212 Technology Building, 301/921-2601.

May 21-22

WORKSHOP ON THERMAL ANALYSIS, NBS, Gaithersburg, MD; sponsored by NBS and the University of Akron; contact: Oscar Menis, B326 Chemistry Building, 301/921-2175.

May 23-25

MECHANICAL FAILURES PREVENTION GROUP, NBS, Gaithersburg, MD; sponsored by NBS and MFPG; contact: Harry Burnett, B264 Materials Building, 301/921-2813.

*June 4-6

SYMPOSIUM ON WEAR AND CORROSION, Carnegie Institute, Washington, D.C.; sponsored by NBS and American Chemical Society; contact: Robert Shane, 202/389-6451.

June 4-6

INTERNATIONAL CONFERENCE ON SYNCHROTRON RADIATION INSTRUMENTATION, NBS, Gaithersburg, MD; sponsored by NBS, Brookhaven National Laboratory, Stanford University, University of Wisconsin, and Cornell University; contact: David Ederer, A251 Physics Building, 301/921-2031.

June 11-15

SYMPOSIUM ON ACCURACY IN POWDER DIFFRACTION, NBS, Gaithersburg, MD; sponsored by NBS, National Research Council of Canada; and the International Union of Crystallography; contact: Stanley Block, A219 Materials Building, 301/921-2837.

June 18-20

FOURTH INTERNATIONAL SYMPOSIUM ON ULTRASONIC TISSUE CHARACTERIZATION, NBS, Gaithersburg, MD; sponsored by NBS and NIH, contact: Melvin Linzer, A329 Materials Building, 301/921-2858.

June 21

18th ANNUAL ACM TECHNICAL SYMPOSIUM, NBS, Gaithersburg, MD; sponsored by NBS and ACM; contact: Seymour Jeffery, A247 Technology Building, 301/921-3531.

June 25

MINORITY BUSINESS MEETING, NBS, Gaithersburg, MD; sponsored by NBS and DOC; contact: L. Goodwin, A715 Administration Building, 301/921-3521.

July 22-27

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, Red Lion Motor Inn, Portland, Oregon; sponsored by NBS and NCWM; contact: Harold Wollin, A211 Metrology Building, 301/921-3677.

*August 13-15

SIMULATION, MANAGEMENT AND MODELING OF COMPUTER SYSTEMS, Boulder, CO; sponsored by NBS; contact: Paul Roth, B250 Technology Building, 301/921-3545.

September 5-7

SYMPOSIUM ON EDDY CURRENT NONDESTRUCTIVE TESTING, NBS, Gaithersburg, MD; sponsored by NBS, ASTM and ASNT; contact: George Birnbaum, A363 Materials Building, 301/921-3331.

*October 9-11

FOURTH ANNUAL CONFERENCE ON MATERIALS FOR COAL CONVERSION AND UTILIZATION, NBS, Gaithersburg, MD; sponsored by NBS and DOE; contact: Samuel Schneider, B308 Materials Building, 301/921-2893.

* *New Listings*

PUBLICATIONS

TEACHER AIDS

by Stan Lichtenstein

The following materials produced by agencies of the Federal Government are recommended by DIMENSIONS/NBS for their potential value to educators as supplements to the classroom or school library.

Free Films from the National Bureau of Standards (LC 1095)

With a cover graced by an on-location shot taken during filming of "The Marketplace" at Baltimore's largest meat and produce market, this 20-page catalog describes National Bureau of Standards films addressing many technical problems and applications. More than 30 color/sound 16-mm films and tapes are catalogued, ranging over subjects as various as why dental fillings fail and how buildings stand up to hurricanes and cyclones. Running times are from 3 to 40 minutes.

The films—some for general, others for specialized audiences—are grouped under General Science, Technical, and Dental headings, the latter reflecting six decades of dental research. Each film description includes a notation indicating the intended audience. The catalog also contains handling and ordering information.

Single copies of the NBS film catalog may be obtained from:

Technical Information and Publications Division
National Bureau of Standards
Administration A617
Washington, D.C. 20234
Phone: 301/921-2318

Flashover: Point of No Return (film)

Now available are both film and slide versions of an audiovisual program presenting the basics of smoke spread and control in institutions such as hospitals and nursing homes. Based on results of an NBS/Department of Health, Education, and Welfare (Public Health Service) research project, the 12-minute 16-mm color film or slide/audio show explains "flashover" as the point at which a small and seemingly inconsequential fire changes into an inferno that can quickly engulf entire rooms. For free film loans, write:

Association Films, Inc.
866 Third Avenue
New York, N.Y. 10022

Purchase of the film at $69.50 (order no. A00453) or of the slide/audio version at $27.25 (order no. A00454) may be made from:

National Audio-Visual Center
General Services Administration
Reference Section
Washington, D.C. 20409

Lichtenstein is a writer and public information specialist in the Public Information Division.

SUPERCONDUCTIVE MATERIALS PUBLICATION

Properties of Selected Superconductive Materials 1978 Supplement, *Roberts, B. W., Nat. Bur. Stand. (U.S.), Tech. Note 983, 99 pages (October 1978) Stock No. 003-003-01946-1, $2.75.**

This report includes data on additional superconductive materials extracted from the world literature up to fall 1977 and is an addendum to the data set published in the *Journal of Physical and Chemical Reference Data 5*, #3, 581-281 (1976). The data presented are new values and have not been selected or compared to values (except for selected values of the elements) previously assembled by the Superconductive Materials Data Center. The properties included are composition, critical temperature, critical magnetic field, crystal structure, and the results of negative experiments. Special tabulations of high magnetic field materials with Type II behavior and materials with organic components are included. All entries are keyed to the literature. A list of recent reviews centered on superconductive materials is included.

Performing Organization: Superconductive Materials Data Center, General Electric Corporate Research and Development, P.O. Box 8, Schenectady, NY 12301.

Sponsored by: Office of Standard Reference Data, National Bureau of Standards, Department of Commerce, Washington, D.C. 20234.

ELASTOMERIC ROOFING

Elastomeric Roofing: A Survey, Rossiter, W. J., Jr., and Mathey, R. G., Nat. Bur. Stand. (U.S.), Tech. Note 972, 54 pages (July 1978) Stock No. 003-003-01954-2, $2.30.

Because of the renewed interest in elastomeric roofing and the potential cost and performance benefits to be gained through its use, the National Bureau of Standards has surveyed the current state-of-the-art of elastomeric roofing technology.

The information obtained in the survey was gathered from a literature search and from the opinions of those knowledgeable in the field. This report lists current elastomeric roofing materials along with test methods for determining the properties of membranes fabricated with these materials.

NBS researchers have identified the factors affecting the performance of the membranes, including durability, design of the roofing system, substrate condition at the time of application, attachment of the membrane to the substrate, and workmanship during application. The report presents a discussion of the advantages, disadvantages, and limitations of elastomeric roofing. It also provides guidelines to assist the potential user in the selection and use of elastomeric roofing for both new and remedial roofing applications.

While the criteria to evaluate or predict the performance of elastomeric roofing were not available, preliminary performance characteristics are suggested in the report as a first step in the development of such criteria.

Sponsored by: Naval Facilities Engineering Command, Dept. of Navy, Washington, D.C. 20390; Directorate of Engineer-

ing and Services, U.S. Air Force, Washington, D.C. 20330; Office of Chief of Engineers, U.S. Army, Washington, D.C. 20314; and the National Bureau of Standards.

Building Technology

Clark, E. J., and Campbell, P. G., Evaluation of Plastic Wallcovering Materials, Nat. Bur. Stand. (U.S.), Tech. Note 984, 43 pages (Oct. 1978) Stock No. 003-003-01982-8, $1.70.

Lew, H. S., Ed., Wind and Seismic Effects. Proceedings of the Ninth Joint Panel Conference of the U.S.-Japan Cooperative Program in Natural Resources, May 24-27, 1977, Tokyo, Japan, Nat. Bur. Stand. (U.S.), Spec. Publ. 523, 518 pages (Sept. 1978) Stock No. 003-003-01979-8, $6.75.

Yancey, C. W. C., and Camacho, A. A., A Seismic Design of Building Service Systems: The State-of-the-Art, Nat. Bur. Stand. (U.S.), Tech. Note 970, 83 pages (Sept. 1978) Stock No. 003-003-01974-7, $2.50.

Computer Science and Technology

Cohen, M. I., and Heimann, P. A., A Microprocessor Controlled Potentiostat for Electrochemical Measurements, J. Res. Nat. Bur. Stand. (U.S.), *83*, No. 5, 429-443 (Sept.-Oct. 1978).

Durbin, G., Kinney, T., Lamasney, P., Newman, E., and Syrett, E., Computer Science and Technology: Guideline on Major Job Accounting Systems: The System Management Facilities (SMF) for IBM Systems Under OS/MVT, Nat. Bur. Stand. (U.S.), Spec. Publ. 500-40, 170 pages (Oct. 1978) Stock No. 003-003-01989-5, $4.00.

Hilsenrath, J., and Breen, B., OMNIDATA—An Interactive System for Data Retrieval, Statistical and Graphical Analysis, and Data-Base Management. A User's Manual, Nat. Bur. Stand. (U.S.), Handb. 125, 294 pages (Sept. 1978) Stock No. 003-003-01972-1, $6.25.

Williams, T. J., Ed., Control Systems Readiness for Munitions Plants: A First Pass. Proceedings of the Workshop on Control Systems Readiness for Munitions Plants held at Purdue University, West Lafayette, IN, Sept. 19-20, 1977, Nat. Bur. Stand. (U.S.), Spec. Publ. 522, 192 pages (Oct. 1978) Stock No. 003-003-01981-0, $3.75.

Health and Safety

Howett, G. L., Kelley, K. L., and Pierce, E. T., Emergency Vehicle Warning Lights: State of the Art, Nat. Bur. Stand. (U.S.), Spec. Publ. 480-16, 167 pages (Sept. 1978) Stock No. 003-003-01901-1, $3.50.

Muehlhause, C. O., A Cost/Benefit Framework for Consumer Product Safety Standards, J. Res. Nat. Bur. Stand. (U.S.), *83*, No. 5, 459-483 (Sept.-Oct. 1978).

Consumer Information and Protection

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NEWS BRIEFS

CONSUMER PRODUCT LABELING PROGRAM SUSPENDED. The Department of Commerce has suspended the Consumer Product Information Labeling Program started on a pilot basis in 1977. It was designed to make product performance information available to consumers at the point of sale. There were several reasons for the decision to suspend the program, but government efforts to reduce expenditures and the effect a funding reduction would have had on the program were cited by the Department as the major factors. NBS had been providing technical support.

LASER ANNEALING OF SEMICONDUCTOR WAFERS. NBS scientists have demonstrated that a tunable dye laser system is very effective in annealing damages in lightly doped ion-implanted silicon. A comparatively long pulse (1 microsecond) laser was shown to remove defects better than thermal annealing systems and to segregate two dopants such as phosphorus and boron.

COMPUTER SECURITY LITERATURE. Technical studies and reports dealing with computer security and privacy issues are catalogued in a new 14-page bibliography issued by the NBS Institute for Computer Sciences and Technology (ICST). Entries with capsule descriptions and ordering information are grouped under: audit and evaluation, cryptography, database security, general computer security, network security, personal identification and access authorization, privacy, and security controls, and safeguards. A single copy of Computer Security Publications is available free from ICST, NBS, Wash., D.C. 20234.

PARTICIPANTS WANTED: DATABASE MANAGEMENT PROGRAM. NBS is seeking organizations with technical expertise and research capabilities in database management systems to participate in cooperative projects related to standards development. Commerce Department requests for proposals involving all aspects of database systems design and use are slated for publication this spring, and contract awards should be completed by late summer. Prospective contractors are invited to obtain background information and helpful documents from R. L. Raybold, Program Contract Manager, B250 Technology Building, NBS, Wash., D.C. 20234.

MAGNETIC MOMENT. A new Standard Reference Material (SRM) issued by NBS is used to calibrate instruments that measure magnetic moment, such as superconducting quantum interference detector magnetometers, vibrating sample magnetometers, and gradient field magnetometers. Nickel Sphere for Magnetic Moment Measurements, SRM 772, is available from the Office of Standard Reference Materials, NBS, Wash., D.C. 20234, for $111.

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